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ABSTRACT

The question considered in this study is whether retroactive interference is influenced by a subject's prior knowledge of the material being studied. Two parallel passages of fictitious biographical information and an accompanying twenty-item short answer criterion test were developed. The fifteen subjects in the experimental group were told that the tests covered the lives of famous characters while the fifteen control group subjects were told that the passages were about fictitious characters. Analysis of results showed that, in comparison to control groups, subjects receiving initial passages labeled with fictitious names experienced significant retroactive interference, while subjects receiving famous name initial passages did not. Results also suggest that predictions based upon an analysis of stimulus materials only will not hold when the materials involved can be radily assimilated into existing knowledge structure. (JM)

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Contributions of Existing Knowledge Structure to Retroactive Inhibition in Prose Learning

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Running Head: Knowledge structure and retroactive inhibition

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Abstract

This experiment tested the hypothesis that prose materials related to existing knowledge structure will be less subject to retroactive interference (RI) than will materials not as easily related to existing knowledge structure. Subjects read successive passages labeled with the names of famous or fictitious characters. In comparison to control groups, subjects receiving initial passages labeled with fictitious names experienced significant RI, whereas subjects receiving famous name initial passages did not.

In recent years a substantial number of studies have appeared (e.g., Anderson & Myrow, 1971; Bower, 1974; Crouse, 1971; Myrow & Anderson, 1972) which demonstrate that the principles of interference theory apply not only to list learning but also to learning of complex prose materials. More specifically, these studies have shown that when passages are constructed to contain different response values for similar item stems, or different item stems and different response values, or similar response values and similar item stems, one can produce either retroactive interference, neutral transfer, or retroactive facilitation, respectively. The essential notion involved in interference theory is that predictions about which type of transfer will occur can be based upon an analysis of the stimulus materials. This analysis would determine the particular pattern of stimulus and response similarity and difference relationships present in successive passages, and would lead to predictions of facilitative, neutral or inhibitory transfer.

The question considered in this study is whether retroactive interference is influenced by a subject's prior knowledge of the material being studied. Imagine, for example, that you are a subject who reads an initial passage that we have told you is about George Washington's experiments in horticulture. You then read a second passage which we tell you is about Winston Churchill's experiments

in horticulture. The question is whether you will remember more about the George Washington passage than will a subject who reads exactly the same passages, but has been told that the passages are about fictitious characters.

Assuming that you knew nothing about the horticulture activities of either Washington or Churchill, it would seem that interference theory would predict that you, and the subject who learns the passages with fictitious labels, would forget equal amounts of the first passage material. The reason for this is that the similarity and difference relationships which exist in the passages are identical. The only thing which has changed is the character labels attached to the passages.

There is, however, a reason for expecting that the results of the two situations will differ. Sullin and Dooling (1974) have produced evidence suggesting that information contained in prose materials which is related to knowledge already existing in memory will be integrated into this previously established knowledge structure. Thus, the information in a passage about George Washington could be integrated into the pre-existing knowledge structure about George Washington. In contrast, exactly the same information, but without the famous character label, might be represented at a location where it is not as well integrated into existing knowledge structure. This presents the pos-

sibility that well integrated material would be more resistant to interference effects than less well integrated material.

Problem

The purpose of the experiment presented in this paper was to test the possibility that information relevant to an existing knowledge structure would be more resistant to interference than would information not relevant to an existing knowledge structure. Two passages designed to be interfering were prepared for the study. Each described the life and summer activities of a boy. Some of the subjects were told that these passages were about a famous person (George Corely Wallace, or Louis "Satchmo" Armstrong), whereas others were told that the passages were about fictitious characters. Our prediction was that subjects receiving an initial passage labeled with the name of a famous character, followed by an interpolated passage designed to be interfering, would experience less interference than those subjects receiving the same initial passage labeled with the name of a fictitious character.

Method

Materials. Two parallel passages of fictitious biographical information (423 and 436 words in length) were developed. Each passage consisted of five paragraphs covering topics such as date and place of birth, occupation

of parents, childhood experiences, hobbies, and events of a special summer. Examples of the first paragraph from each of the two passages is presented below[2]:

> Louis "Satchmo" Armstrong was born in 1900 in the outskirts of a large city near the Mississippi border. He was the youngest of ten children. A disaster struck the family when Louis was four years old. Their large ramshackled home burnt to the ground killing Louis' oldest sister, Sarah. For some time Louis' family had to move in with an aunt. As a result, his parents had to work even harder; Louis' father as a factory worker and his mother as a cook.

> George Corely Wallace was born in 1919 in a bustling small town near Georgia's border. He was the oldest of four children. The family lived in a small yellow house on a narrow tree-lined side street near the railroad tracks. He would play alone for hours in the back yard with his favorite toy, given to him by his grandfather Amory. When George was eight years old he was very much affected by the tragic death of his oldest sister Annie, due to polio.

In addition to the passages, a 20 item short answer criterion test was prepared to accompany the passages. This test was identical for both passages and asked for answers such as year of birth, favorite childhood toy, childhood hobby, and number of children in the family. Prior to running the major experiment, these tests were administered to four groups of subjects who had not read the passages. Two of the groups were told the tests covered the lives of the famous characters, Wallace and Armstrong. The remaining two groups were told the tests covered the lives of fictitious persons (Thomas Clark and Homer Hill). All subjects were instructed to guess if they did not know the answers. Those questions which had a higher probability of being answered correctly by the famous person groups than by the fictitious person groups were eliminated and the passage texts were revised. This procedure was repeated until both the famous person groups and the fictitious person groups responded to all of the questions at virtually a zero percent correct level.

Design and subjects. The design of the experiment is contained in Table 1. As can be seen, it was a 2 (Passage 1 or Passage 2 as the first passage) x 2 (label of first passage, famous or fictitious) x 3 (type of interpolated learning, famous, fictitious or control) factorial with fifteen college students randomly assigned to each group. As an

initial passage. This passage was labeled with the name, "Louis Armstrong." They then received Passage 2 as the interpolated passage which was labeled with the name "George Wallace."

Procedure. Prior to the experiment the envelopes containing the materials were arranged in random order and were distributed to subjects in order of their appearance for the experiment. The subjects were run in groups ranging in size from four to twenty. After reading instructions which indicated the general nature of the experiment, and identifying the initial passage as being about a famous or fictitious person, the subjects were given 30 seconds to read each of the five paragraphs of text. They then replaced their initial passages in the envelopes and read instructions pertaining to the second passage. After reading these instructions they were again given 30 seconds to read each of the five paragraphs of second passage text. The control groups completed an abstract reasoning task during the time the experimental group subjects were reading the second passage.

Following the acquisition phase of the experiment the subjects replaced all of the materials in the envelopes and were given a blank sheet of paper. They were instructed to write down as much of the first passage content on their sheet as they could remember. The subjects were given as

much time as they desired for this task. After completing the free-recall task the subjects were given the 20 item criterion test. The test sheet had a person label (e.g., George Corely Wallace Test, Thomas Clark Test) at the top of the sheet and the 20 items listed below. In addition, the subjects were instructed to remember the test covered by the first passage they had read. The subjects were again given as much time as they desired for this task.

Scoring. Each of the two passages was subjectively divided into idea units which were used to score the free-recall protocols. The Armstrong-Clark passage contained 79 idea units and the Wallace-Hill passage contained 89. An undergraduate assistant who was naive to the purposes of the experiment scored the recall protocols for the presence of these idea units which were transformed into proportions. Five of the protocols from each of the groups were then randomly selected and rescored by the senior author. The interscorer reliability coefficient for this sample was .93.

The criterion test was scored by first generating a list of acceptable answers to the criterion test, and then scoring each test according to the list. The undergraduate assistant mentioned above scored all of the protocols, and the senior author rescored five of the protocols from each group. There were no disagreements between the two scorers in this sample.

The final dependent variable examined in the study was the number of second passage responses which intruded as answers on the first passage criterion test. Again, there were no disagreements between scorers on this variable.

Results

Criterion test. The mean number of correct responses on the criterion test are presented in Table 1.

Insert Table 1 about here

A 2 X 2 X 3 analysis of variance indicated that type of interpolated activity was the only significant source of variance, $F(2,168)=5.07$, $p < .01$. Following this analysis a series of planned comparisons were performed. The purpose of the first was to determine if the experimental procedure produced retroactive interference. Accordingly, the eight experimental groups were compared to the four control groups. This comparison indicated that there was a significant amount of retroactive interference present in the experiment ($F=10.1$, $p < .01$).

The next two comparisons tested the hypothesis that subjects receiving initial passages labeled with the names of famous characters would experience less retroactive interference than would subjects receiving the same initial

passages with fictitious character labels. The first comparison contrasted the four groups receiving an initial passage labeled with the name of a famous person (groups 1, 2, 7, and 8) with the two control groups receiving a famous name first passage (groups 3 and 9). This comparison yielded a nonsignificant statistic ($F=1.79$). The second comparison contrasted the four experimental groups receiving a fictitious name first passage (groups 4, 5, 10, and 11) with the two control groups receiving a fictitious name first passage (groups 6 and 12). This comparison provided a highly significant statistic, $F=9.92$, $p < .01$.

Proportion correct and intrusion errors. The analysis of the proportion of correctly recalled idea units yielded essentially the same outcomes as the analysis of correct answers on the recall test. Experimental group subjects who received an initial passage labeled with a famous name did not differ from control group subjects who received a famous name first passage ($F < 1$), and experimental group subjects who received an initial passage labeled with a fictitious name recalled significantly less than did their controls, $F=5.7$, $p < .05$.

The analysis of intrusion errors made on the recall test yielded little information of interest. As would be expected, the experimental groups made many more intrusion errors than the control groups. However, the average number of intrusion errors made by the groups receiving an ini-

tial passage labeled with a fictitious name only slightly (and nonsignificantly) exceeded the number of intrusion errors made by the groups receiving an initial passage labeled with a famous name (1.52 vs. 1.48).

Discussion

The purpose of this experiment was to test the hypothesis that the existence of relevant prior knowledge will influence the amount of retroactive interference a subject experiences in a situation designed to produce interference. More specifically, it was hypothesized that subjects who received an initial passage labeled with the name of a famous person would experience less retroactive interference than would subjects who read the same passage labeled with the name of a fictitious character.

The results of the experiment supported this prediction in that subjects receiving a famous name initial passage, followed by an interpolated passage, did not differ in recall from control subjects who did not receive an interpolated passage. In contrast, experimental group subjects receiving initial passages labeled with a fictitious name recalled significantly less than did their controls.

One aspect of our data, however, was not consistent with our expectations. We had expected that the groups receiving an initial fictitious name passage followed by a famous name interpolated passage would experience less retro-

active interference than would the groups receiving an initial fictitious name passage followed by a fictitious name interpolated passage. The logic behind this expectation was that the material contained in the interpolated famous name passage should be integrated into the learner's existing knowledge structure, thereby interfering only minimally with the previously learned passage labeled with the fictitious name. In contrast, the subject receiving two successive passages labeled with the names of fictitious characters should experience maximal interference since the passage labels provide no guidelines for integrating the material into prior knowledge structures. As one can see from examining Table 1, this expectation was not confirmed.

At this point we do not know why this corollary to our central hypothesis was not supported. Our speculation is that information which cannot be related to existing knowledge structure is highly susceptible to the loss of retrieval cues which guide memory search during the recall process. This speculation suggests that learning even remotely related information will interfere to some degree with the retention of learned information which is not well integrated into an established knowledge structure. Postman and his associates (Postman, Stark, & Fraser, 1968) have provided support for this hypothesis in the context

of list learning experiments and it is possible that the effect is also operative in prose learning.

Interference theory maintains that predictions about the amount of loss (or gain) in an experiment involving successively learned passages can be based upon an analysis of the stimulus materials alone. The fact that our central hypothesis concerning the role of prior knowledge in providing resistence to retroactive interference was supported suggests that interference theory will have to be extended to account for these results. Our results suggest that predictions based upon an analysis of stimulus materials only will not hold when the materials involved can be readily assimilated into existing knowledge structure.

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Footnotes

1. Requests for reprints should be sent to James M. Royer, Department of Psychology, University of Massachusetts, Amherst, Massachusetts, 01002.
2. Copies of the passages used in this study are available upon request to the authors.

Table 1

Mean Number of Correctly Recalled Criterion Test Items

Version of first passage	Label of first passage	Type of interpolated learning: Famous	Fictitious	Control
1	Famous (Armstrong)	11.27(1)	10.67(2)	12.0(3)
	Fictitious (Clark)	10.60(4)	11.00(5)	13.60(6)
2	Famous (Wallace)	12.27(7)	12.6(8)	13.67(9)
	Fictitious (Hill)	10.67(10)	10.67(11)	13.20(12)

MSe = 14.32